8 April 1959

25X1C8c
[redacted]

In answer to your letter of 17 February which we received on 14 March, we feel that an average cost curve of 90 percent is too high. We believe that an average cost curve of 86 or 87 percent would be better.

In your letter you stated "although the airframe curve would be in the neighborhood of 80%, all other items would be made for so many different aircraft that it would tend to drive the overall cost curve considerably higher". We discussed this point with [redacted] 25X1C8c during his visit here. The cost of items other than the airframe would tend to raise the average cost curve above 80 percent. For purpose of discussion, we assumed that these items would have a slope of 95 percent and that their cost would equal 40 percent of the airframe cost at the first unit. These items, however, would average less than 40 percent for the first unit as indicated by the following:

Model	Quantity	Cost of "Other Items" as a Percent of Airframe Cost
B-52A, B	First 20	18%
B-58A	First 17	12%
F-104A	First 17	58% a/
F-107A	First 17	6%

a. The engines on the first F-104 were not the engines for which the aircraft was designed and these engines were very expensive - over twice the cost of the regular engine.

If the "other items" equal 40 percent of the airframe cost at the first unit and if the number of "other items" produced equal the number of airframes produced, the total cost curve would have about a 89 percent slope between units 50 and 1,000. If, however, the number of other items produced is 5 times the number of airframes, then the slope of the total cost curve is approximately 88 percent between units 50 and 1,000. (See Attachments 1 and 2). The effect of all other items being made for so many different aircraft, therefore, would tend to drive the overall cost curve lower than if these items were produced for only one aircraft.

In connection with your thought of identifying which unit of a given span would be representative of the average cost for that span, consider the following:

Span of units from 51-100

Learning Curve 85%

Cumulative average cost at unit 100 = 33.97%

Cumulative average cost at unit 50 = 39.96%

Total cost of first 100 units = 100 x .3397 = 33.97%

Total cost of first 50 units = 50 x .3996 = 19.98

Total cost second 50 units 13.99%

Average cost = $\frac{13.99}{50}$ = .2796 or 27.96%

The first point one would probably pick to be representative of the average cost for a given span is the arithmetic mean of the span:

Cumulative average cost of unit 75 (the arithmetic mean of the span) = 36.34%

Unit cost at unit 75 = 36.34 (1-m)

= 36.34 (.7655) = 27.82%

Cost of units 51-100 = 50 x .2782 = 1391.0%

A better point might be the mid-point of the line representing the lot on the logarithmic scale:

Geometric mean = $\sqrt{100\ (50-1)}$ = $\sqrt{4900}$ = 70

Unit cost at unit 70 = 36.93%(1-m) = 36.93 (.7655)

= 28.27%

Cost of units 51-100 = 50 x 28.27% = 1413.5%

As shown above neither the arithmetic mean nor the geometric mean is entirely satisfactory. The arithmetic mean of the arithmetic mean and the geometric mean gives the following:

A.M. = 1/2 (70 + 75) = 72.5

Unit cost at unit 72.5 = 36.63% (.7655) = 28.04%

Cost of units 51-100 = 50 x 28.04% = 1402.0%

Thus, the arithmetic mean of the arithmetic mean and the geometric mean gives the smallest error.

25X1A5a1 [redacted] is making a study for us comparing US and [redacted] production costs. The results will be forwarded to you if the study is any good. 25X1X7

Concerning the ruble-pound ratio, we believe the 12:1 ratio is too low. Using your cost figure per pound of basic weight (empty weight), your 90 percent curve, your [redacted] index, and the Soviet prices, we get a ruble-pound ratio of 22:1 for a fighter and 17:1 for a transport in 1950. If we use an 87 percent curve for the fighter, we get a ratio of 29:1. We don't claim our figure is correct since many assumptions were made in our study as you well know, but we feel certain that the 12:1 ratio is too low for the cost figures which you are using. 25X1X7

You sent us an index [redacted] aircraft costs for the years 1950 through 1958. Could you send us the index figures for 1946-1949? 25X1X7

We will forward the Bison plots to [redacted] in the near future. 25X1C8c
25X1C8c We are waiting for some information from [redacted] little safe.
We discussed the Bison with [redacted] and showed him the plots.

25X1C8c Regarding [redacted] interest in a study of plant ability to produce modern fighters as opposed to older ones, I believe he is referring to some AFCIN information. Your friend, [redacted] stated 25X1A9a
25X1X7 [redacted] that Republic with a maximum effort could produce only 88 F-105 aircraft per month compared to 176 F-84 aircraft per month. [redacted] also stated that number one flow time on the F-105 25X1A9a
25X1A9a was 360 days compared to 260 days for the F-84. [redacted] stated this was because of a more sophisticated weapon system. What [redacted] did not 25X1A9a realize is that the F-105 is twice as heavy as the F-84. The airframe weight of the F-105 is 16,200 pounds. The airframe weight of the

F-84 were as follows:

Model	Airframe Weight - Pounds
F-84A	6,000
F-84B	6,600
F-84C	6,700
F-84D	7,000
F-84E	8,100
F-84G	8,700

The direct man-hours per pound for the 100th F-84 was 4.5 compared to 5.5 for the F-105. The slope, however, for the F-105 is 65 percent (between the 10th and 100th unit) compared to 73 percent for the F-84.

25X1A9a [redacted] was talking about something he did not understand.

Thank you for the information on spares.

Today is Baseball Opening Day Eve according to 25X1A9a [redacted]

Major Al Erwin just called to find out where he could locate you. He had forgotten you were [redacted] He is going to Japan as an Assistant Air Attache.

25X1X7

Sincerely,

25X1A9a
[redacted]

Attachments (2)

Distribution:
Orig. and 1 - Addressee
1 - SA/RR
1 - D/I
1 - I/AR
25X1A9a
ORR:D/I/A[redacted]lr (3835)

Attachment 1

Year	Number of Airframes	Cumulative Airframes	Number of "Other Items"	Cumulative "Other Items"	Cumulative Average Cost of Airframe Million $	Cumulative Average Cost of "Other Items" Million $	Cumulative Average Cost of Aircraft Million $
A. Number of "Other Items" Produced Equal Number of Airframes Produced							
1954	1	1	1	1	1.000	0.400	1.400
1955	49	50	50	50	0.283	0.303	0.586
1956	250	300	250	300	0.160	0.268	0.428
1957	300	600	300	600	0.129	0.256	0.385
1958	300	900	300	900	0.109	0.247	0.356
1959	300	1200	300	1200	0.103	0.242	0.345
B. Number of "Other Items" Produced is 5 times Number of Airframes Produced							
1954	1	1	5	5	1.000	0.358	1.358
1955	49	50	245	250	0.283	0.271	0.554
1956	250	300	1250	1500	0.160	0.240	0.400
1957	300	600	1500	3000	0.129	0.229	0.358
1958	300	900	1500	4500	0.109	0.222	0.331
1959	300	1200	1500	6000	0.103	0.218	0.321

SECRET

SECRET